

CLAIMS

1. Positron source, this source comprising means  
(20) of generating an electron beam and a target (28)  
that comprises a substantially plane surface, this target  
being designed to receive an electron beam on this  
5 substantially plane surface, at a predetermined angle of  
incidence, counted with respect to the substantially  
plane surface, and to generate positrons by interaction  
with this electron beam, this source being characterized  
in that the generated electron beam is continuous or  
10 quasi-continuous and the energy of the electrons is of  
the order of 10 MeV, and the target thickness is less  
than 500  $\mu\text{m}$  and the predetermined angle of incidence is  
less than  $10^\circ$ .

15 2. Positron source according to claim 1, in which  
the thickness of the target (28) is within the interval  
ranging from 10  $\mu\text{m}$  to 100  $\mu\text{m}$  and the predetermined angle  
of incidence is within the interval ranging from  $2^\circ$  to  
5 $^\circ$ .

20 3. Positron source according to either of claims 1  
and 2, in which the electron beam generation means  
generate a continuous beam and comprise an electron  
accelerator (20) comprising a coaxial cavity that  
25 electrons pass through several times in a median plane  
perpendicular to the axis of this cavity.

4. Positron source according to any one of claims 1 to 3, also comprising sorting means between positrons and electrons that did not interact with the target, said sorting means comprising:

- 5       - first magnetic means (26), whose axis is close to the beam axis and passes through the plane of the target, and which are designed to generate a magnetic field that can make positrons emitted by the target diverge, these first magnetic means  
10       being arranged on the input side of the target at an appropriate distance,
- a magnetic quadrupole (30) for focusing the positron beam, said magnetic quadrupole having the same axis as the first magnetic means, being  
15       placed on the output side of the target, and being designed to make the positron beam section circular, said positron beam being very flat at the output from the area of the interaction between electrons and the target,
- 20       - first stop means (32), located on the axis of the first magnetic means, on the output side of the quadrupole, at a sufficiently long distance to focus positrons into a beam with a circular section, said first stop means being designed to  
25       stop electrons from the electron beam that did not interact with the target,
- second magnetic means (36), along the same axis as the first magnetic means, arranged on the output side of the first stop means, at an appropriate

distance from the first magnetic means to generate a magnetic field capable of making the positrons converge, the first and second means cooperating to generate a magnetic field capable of preventing these positrons from encountering the first stop means.

5. Positron source according to any one of claims 1 to 4, also comprising:

- 10 - trapping means (46) designed to trap positrons generated by the target,
- guiding means (42) designed to guide these positrons towards these trapping means.

15 6. Positron source according to claim 5, in which the trapping means (46) include a Greaves-Surko trap.

7. Positron source according to claim 4 and any of claims 5 and 6, also comprising:

- 20 - second stop means (38), designed to stop electrons in the electron beam which did not interact with the target and which reached a zone between the second magnetic means and the trapping means, and to prevent these electrons from reaching these trapping means, and,
- 25 - means of guiding (42) positrons towards the trapping means through these second stop means.